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(54) COEXISTENCE TECHNIQUE IN WIRELESS NETWORK

(57)Abstract

PROBLEM TO BE SOLVED: To provide a coexistence
technique which is used for frequency coordination
between two different network protocols, such as the
IEEE 802.11 and Bluetooth protocols, operating in
proximity with one another.

SOLUTION: Coordination is accomplished by the use of
a first radio transceiver operating in accordance with a
first communication protocol (which may be the 802.11
protocol) and using a frequency band (which may be the
2.4 GHz band), a base station connected to a wired
network and operating in accordance with the first
communication protocol, a second radio transceiver
operating in accordance with a second communication
protocol (which may be the Bluetooth protocol) and
using the frequency band, and a coordinator associated
with the base station for, in turn, activating the first
radio transceiver, deactivating the first radio transceiver,
activating the second radio transceiver, and deactivating
the second radio transceiver.
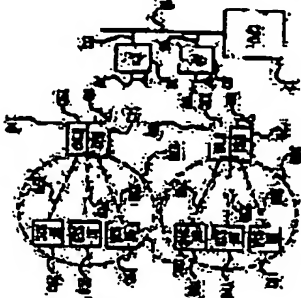
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1.This document has been translated by computer. So the translation may not reflect the original precisely.
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CLAIMS

[Claim(s)]

[Claim 1] The 1st wireless transceiver which operates according to the 1st communications protocol and uses a certain frequency band. The base station which operates according to said 1st communications protocol, and the 2nd wireless transceiver which operates according to the 2nd communications protocol and uses said frequency band. It is combined with said base station and said 1st wireless transceiver is made to energize in order. Equipment for the transmitting adjustment characterized by having the regulator for making said 1st wireless transceiver de-energize, making said 1st wireless transceiver energize and making said 2nd wireless transceiver de-energize.

[Claim 2] Equipment according to claim 1 characterized by said frequency band being 2.4GHz.

[Claim 3] Equipment according to claim 2 characterized by said 1st communications protocol being an IEEE802.11 protocol.

[Claim 4] Equipment according to claim 3 characterized by said 2nd communications protocol being the Bluetooth protocol.

[Claim 5] Equipment according to claim 4 characterized by carrying said 1st wireless transceiver and said 2nd wireless transceiver in [both] housing.

[Claim 6] Equipment according to claim 5 characterized by said housing being suitable for wearing to a belt.

[Claim 7] Equipment according to claim 5 characterized by having further 1 or the slave unit beyond it which is combined with said 2nd transceiver and operates according to said 2nd communications protocol.

[Claim 8] Equipment according to claim 7 characterized by being the scanner by which a user's finger can be equipped with at least one of said slave units beyond 1 or 2.

[Claim 9] Equipment according to claim 8 characterized by the ability of said scanner to transmit bar code information to said 2nd transceiver.

[Claim 10] Equipment according to claim 7 characterized by at least one of said slave units beyond 1 or it being a printer.

[Claim 11] Equipment according to claim 7 characterized by at least one of said slave units beyond 1 or it being personal-data management equipment.

[Claim 12] Equipment according to claim 5 characterized by being said 1st hour and said predetermined spacing of immobilization the 2nd hour by making said 1st wireless transceiver energize, and a period 8 while making said 1st wireless transceiver de-energize, and a period while making said 2nd wireless transceiver de-energize turning into the 2nd hour.

[Claim 13] Equipment according to claim 12 characterized by the 2nd hour being said 1st hour and said equal spacing.

[Claim 14] The 1st wireless transceiver which operates according to the 1st communications protocol and uses a certain frequency band. The base station which operates according to said 1st communications protocol, and the 2nd wireless transceiver which operates according to the 2nd communications protocol and uses said frequency band. Both the preparation, said 1st wireless transceiver, and said 2nd wireless transceiver are carried in housing. Make said 1st

wireless transceiver energize and said 1st wireless transceiver is made to de-energize in order. Equipment for the transmitting adjustment characterized by having the regulator combined with said housing for making said 2nd wireless transceiver energize and making said 2nd wireless transceiver de-energize.

[Claim 15] Equipment according to claim 14 characterized by being said 1st hour and said predetermined spacing of immobilization the 2nd hour by making said 1st wireless transceiver energize, and a period a while making said 1st wireless transceiver's de-energize turning into the 1st hour, making said 2nd wireless transceiver energize, and a period while making said 2nd wireless transceiver de-energize turning into the 2nd hour.

[Claim 16] Equipment according to claim 15 characterized by said frequency band being about 2.4GHz.

[Claim 17] Equipment according to claim 16 characterized by said 1st wireless transceiver de-energize turning into the 2nd hour.

[Claim 18] Equipment according to claim 18 characterized by the 2nd hour being said 1st hour and said equal spacing.

[Claim 19] Equipment according to claim 18 characterized by said 1st communications protocol being an IEEE802.11 protocol.

[Claim 18] Equipment according to claim 18 characterized by said 2nd communications protocol being the Bluetooth protocol.

[Claim 18] Equipment according to claim 14 characterized by being said 1st hour and said predetermined spacing of immobilization the 2nd hour by making said 1st wireless transceiver's de-energize, and a period a while making said 1st wireless transceiver's de-energize turning into the 1st hour, making said 2nd wireless transceiver energize, and a period while making said 2nd wireless transceiver de-energize turning into the 2nd hour.

[Claim 20] It is equipment for the transmitting adjustment which operates according to an IEEE802.11 protocol, uses about 2.4GHz frequency band, operates according to the Bluetooth protocol with the 1st antenna system, and the base station which operates according to said IEEE802.11 protocol, uses about 2.4GHz frequency band, is equipped with the 2nd wireless transceiver with the 1st antenna system, and is characterized by for said 1st antenna system and said 2nd antenna system according to an IEEE802.11 protocol, operates according to the Bluetooth protocol with the 1st wireless transceiver which uses about 2.4GHz frequency band, and the base station which operates according to said IEEE802.11 protocol, is equipped with the 2nd wireless transceiver which uses said about 2.4GHz frequency band, and is characterized by transmitting said Bluetooth protocol transmission with the power level of about 0dBm.
 [Claim 22] The 1st wireless transceiver which uses about 2.4GHz frequency band which operates and has 2 or a sub-band beyond it. The base station which operates according to said IEEE802.11 protocol. The 2nd wireless transceiver which operates according to the Bluetooth protocol and uses said about 2.4GHz frequency band. It is equipment for the transmitting adjustment characterized by for a preparation and said IEEE802.11 protocol transceiver using one of the sub-bands beyond 2 or it, and said Bluetooth protocol transceiver using one more of said sub-bands beyond 2 or it.

[Claim 23] The 1st wireless transceiver which uses about 2.4GHz frequency band which operates according to an IEEE802.11 protocol and has 2 or a sub-band beyond it. The base station which operates according to said IEEE802.11 protocol, It operates according to the Bluetooth protocol and has the 2nd wireless transceiver which uses said about 2.4GHz frequency band. Said 2nd wireless transceiver Equipment for the transmitting adjustment characterized by having the look ahead function for judging whether it is the which 2 or the sub-band beyond it is used by the 1st wireless transceiver, and is used also by said 2nd wireless transceiver.

[Claim 24] The 1st wireless transceiver which operates according to the 1st communications protocol and uses a certain frequency band. The base station which operates according to said 1st communications protocol, and the 2nd wireless transceiver which operates according to the 2nd communications protocol and uses said frequency band. Equipment for the transmitting adjustment characterized by having the regulator combined with said 1st wireless transceiver in order to make said 2nd wireless transceiver de-energize, while said 1st wireless transceiver is using it.

[Claim 25] The action time which is the approach of operating a portable data communication unit using the 1st wireless data communications protocol and the 2nd wireless data communications protocol, uses said 1st communications protocol, and transmits and receives a data communications signal. The quiescent time which carries out neither transmission of the

data communication signal with which said equipment uses said 1st protocol, nor reception. Said data communication unit is operated in the power reduction mode of the 1st communications protocol which the aforementioned equipment has. Said data communication unit is operated as master equipment by said 2nd communications protocol. The approach characterized by controlling actuation of the slave unit which is communicating with this data communication unit by said data communication unit, and controlling to operate said actuation only between said quiescent times with said 2nd data communication protocol.

[Claim 26] The approach according to claim 25 said control includes giving the signal with which said action time shows that it starts following a predetermined time interval and actuation is ended with said 2nd data communication protocol between said time interval.

[Claim 27] The approach according to claim 25 characterized by said 1st wireless data communications protocol being said IEEE802.11 protocol.

[Claim 28] The approach according to claim 27 characterized by said 2nd radio protocol being Bluetooth.

[Claim 29] An access point and at least one portable type unit arranged so that it may be combined with said access point using the 1st wireless protocol and other units and wireless data transmission may be performed using the 2nd wireless protocol. Are the approach of operating a preparation stateless data telecommunication system, and a portable beacon signal is transmitted from said access point with said 1st wireless protocol. The comprehensive ready-for-sending ability signal for preventing a portable type unit transmitting a signal using said 1st data communication protocol between the time intervals to which it was distributed within said beacon signal period it transmits from said access point with said 1st wireless protocol. Between said allocation time intervals, it controls so that said access point sends data transmission. The approach characterized by operating said portable type unit so that it may function as master equipment which answers said comprehensive ready-for-sending ability signal, and uses said 2nd wireless protocol between said allocation time intervals and radio may be performed.

[Claim 30] The approach according to claim 29 characterized by said 1st wireless data communications protocol being said IEEE802.11 protocol.

[Claim 31] The approach according to claim 30 characterized by said 2nd radio protocol being Bluetooth.

[Claim 32] It is the approach according to claim 29 characterized by dividing said beacon signal period into three time intervals, for said access point performing data communication in power reduction mode between the 1st time interval, for said allocation time interval being the 2nd time interval, and said access point performing data communication between the 3rd time interval using said 1st wireless protocol.

[Claim 33] The approach according to claim 32 that said 1st time interval is characterized by continuing immediately it said beacon signal.

[Claim 34] The approach according to claim 32 characterized by said 1st wireless data communications protocol being said IEEE802.11.

[Claim 35] The approach according to claim 34 characterized by said 2nd radio protocol being Bluetooth.

[Claim 36] A master transceiver transmits to a slave unit between the 1st even number time slots. A slave unit transmits to said master equipment between odd number time slots. Said transmission came to be performed following the frequency hop pattern predetermined at the hop rate according to said time slot. It is the approach of operating a data telecommunication system using a master-slave protocol. Said master equipment is operated so that an interference signal may be detected on the frequency corresponding to the following time slot in the 1st hour of each time slot. The approach characterized by inhibiting transmission by said master transceiver between even number time slots when an interference signal is detected between either of the time slots before current or it.

[Claim 37] The approach according to claim 36 characterized by including the phase readjusted so that the signal corresponding to the frequency on which said master equipment is adjusted, said actuation phase detects the reinforcement of the received signal so that the signal corresponding to the frequency distributed to the time slot following a degree may be received.

and said master equipment is distributed to the current time slot may be transmitted and received.

[Claim 38] The approach according to claim 37 characterized by said protocol being Bluetooth.

[Claim 39] It is arranged so that it may communicate with an access point using the 1st data communication protocol. It is an approach for performing video communication in the wireless data telecommunication system equipped with the portable type unit arranged so that it may communicate with other equipments using the 2nd data communication protocol. The data corresponding to said video communication are communicated between said portable type units and portable type YUMITSU, and TO using said 1st data communication protocol. Between the time intervals which avoid interference with said communication link which uses said 1st data communication protocol Said data corresponding to said voice communication are communicated between said portable type units and portable equipment which use said 2nd data communication protocol. The approach characterized by consisting of changing a sound signal into the data corresponding to said sound signal, and changing the data signal corresponding to a sound signal into a sound signal in said portable equipment.

[Claim 40] The approach according to claim 39 characterized by including the sound signal data with which said data corresponding to a sound signal were compressed.

[Claim 41] The approach according to claim 39 characterized by said 1st communications protocol being said IEEE802.11 protocol.

[Claim 42] The approach according to claim 41 characterized by said 2nd communications protocol being Bluetooth.

[Claim 43] The approach according to claim 42 characterized by said communication. Erik between said portable type units and said portable equipment using the Bluetooth ACL link. The approach according to claim 43 characterized by said data corresponding to a sound signal containing compression sound signal data.

[Claim 45] It is arranged so that it may communicate using the 1st and 2nd data communication protocol which operates with the same frequency band. It is the approach of operating the portable type unit which came to receive the beacon signal which is combined with an access point and divides a time interval clearly with said 1st communications protocol from this access point. While the portable type unit combined with said access point has inhibited the transmission which uses said 1st data communication protocol. The approach characterized by what said portable type unit is operated for as master equipment so that the signal which specific as said a part of time interval may be received from said access point and it may communicate with a slave unit in between for said specification part [time interval / said] using said 2nd data communication protocol.

[Claim 46] The approach according to claim 45 characterized by said 1st protocol being said IEEE802.11 protocol.

[Claim 47] The approach according to claim 46 characterized by equipping said signal with a GTS signal.

[Claim 48] The approach according to claim 47 characterized by said 2nd protocol being Bluetooth.

[Claim 49] It has at least one access point and at least one portable type unit. It communicates with said access point which uses the 1st wireless data communications protocol in the 1st frequency band. It is an approach for operating the wireless data network containing the portable type unit arranged so that it may communicate with other equipments which uses the 2nd wireless data communications protocol in said 1st frequency band. The signal which displays the time amount which inhibits that the portable type unit combined with said access point transmits using said 1st data communication protocol in order to perform the equipment and wireless data transmission which transmit from said access point with said 1st communications protocol, use said 2nd data communication protocol, and operate as a slave unit between said assignment time amount besides the above. The approach characterized by what said portable type unit is operated for as master equipment.

[Claim 50] The approach according to claim 49 characterized by said 1st communications protocol being said IEEE802.11 protocol.

[Claim 51] The approach according to claim 48 characterized by equipping said signal with a CTS signal.

[Claim 52] Operate with the same frequency band, and it is arranged so that it may communicate using the 1st and 2nd data communication protocol. It is an approach for operating the portable type unit combined with the access point. So that the 1st and 2 control signals may be received in said portable type unit using said 1st data communication protocol, said 1st control signal may be answered and it may operate as master equipment Moreover, so that a slave unit and data communication may be performed using said 2nd data communication protocol The approach characterized by what said portable type unit is operated, said 2nd control signal is answered and the communication first which uses said 2nd data communication protocol by said portable type unit is interrupted for.

[Claim 53] The approach according to claim 41 characterized by said 1st protocol being said IEEE802.11 protocol.

[Claim 54] The approach according to claim 42 characterized by equipping said signal with a CTS signal.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]
[Field of the Invention] This application charges the profits of temporary application of the serial numbers 60/175,282 of January 10, 2000 presentation, and temporary application of the serial numbers 60/196,979 of April 13, 2000 presentation. If this invention is further specified about, a wireless data network, it relates to the equipment for guaranteeing coexistence between the wireless networks which share the same frequency band as a different actuation protocol.

[0002]
[Description of the Prior Art] Radio equipment communicates mutually using the protocol which is transmitted in the predetermined frequency band and on which it has agreed. The equipment which uses one or the wireless protocol beyond it operates by transmission in the same frequency band in many cases. Therefore, in order for the equipment which uses one or the wireless protocol beyond it to operate efficiently within the same frequency band to coincidence, it is necessary to develop adjustment technique.

[0003] For example, the grantee of this invention supplies the wireless data telecommunication system following the IEEE802.11 standard (802.11) communications protocol incorporated here by citation known as spectrum (Spectrum) 24 (trademark). If this system is carried out, a portable type unit (MU) will consider data communication as a central computer through one or the access point beyond it (AP). AP communicates with a computer through a direct or Ethernet (trademark) cable network. Each of MU is combined with one of the AP. This communications protocol is using the 2.4GHz ISM band as defined as 802.11.

[0004] In that, by which the current design is carried out, in order that the 802.11 equipment may work as a wireless Local Area Network, some predetermined approaches will be used for the transmission in a 2.4GHz band. One approach is using a frequency-hopping diffusion spectrum (FHSS) mechanism. In it, time amount transmission is carried out and data continue transmission in a channel which has been set to the specific channel and which is different by the die length of predetermined time amount similarly following a fake random sequence. 802.11 equipments designed now operate at the rate of cycle hop of 10 hop per second. Another approach is using a direct sequence diffusion spectrum (DSSS) mechanism, according to it, said data are transmitted in a predetermined cycle channel, and the multiplication of the pseudo-random chipping sequence between transmission is carried out.

[0005] Since all 802.11 equipments are using the same ISM frequency band, the interference in these equipments is minimized by use of a subcarrier sensing multi-access / collision-prevention (CSMA/CA) protocol. Under CSMA/CA, he asks whether 8021.11 equipment has the transmission from another equipment, before starting its transmission. If other transmission is not detected equipment transmits its information and waits for the acknowledgement (ACK) from receiving-side equipment. When reception acknowledgement is not received, after with a predetermined time interval after waits for equipment between the time intervals chosen at random, it transmits again. Therefore, two or the equipment beyond it starts transmission in order that each coincidence, and when interference produced as a result bars of transmission, in order that each equipment may try retransmission of message, it will wait for it the time chosen at random. This

enabled equipment to transmit to separate time amount.

[0005] Another example of the wireless specification which similarly uses said 2.4GHzISM frequency band is Bluetooth (trademark), and this is designed for the communication link between the equipment within the narrow limits transmitted with lower power level. The Bluetooth specification is available at www.bluetooth.com. Bluetooth is operating at a rate of 1600 hop per second using a frequency-hopping diffusion spectrum mechanism as designed now. Bluetooth uses communicates master/slave system. An example of the Bluetooth network is a portable type unit with which the belt of the user who communicates with the cordless scanner with which reads a bar code and a user is equipped as a ring is equipped in this case, a portable type unit operates as a master and a cordless ring scanner operates as a slave. In the system for this data transmission, a master and a slave communicate only in predetermined spacing. At the 1st spacing, a master communicates to the 1st slave and the 1st slave unit answers only between the 2nd spacing. At the 3rd spacing, a master communicates to the 2nd slave and the 2nd slave unit answers only between the 4th spacing. By using this system, it is one equipment in specific Bluetooth? "a pico network" — it becomes certain that an injury transmits to specific time amount. Therefore, interference is minimized.

[0006] In addition, as for one Bluetooth pico network, it is desirable to approach the Bluetooth pico network which another object separated, and to operate. It is because there is a cycle channel from which 79 used by Bluetooth differed, so a different Bluetooth network is hard to come to operate on the same frequency as coincidence. Therefore, the interference during the separate Bluetooth pico network is minimized. Many individuals who approach mutually and are working by this, for example can each own separate portable type unit with a cordless ring scanner.

[0007] The need of adjusting transmission of the equipment which operates under a different protocol which uses the same frequency band with the need of approaching and operating many networks of the same protocol is recognized in the industry. For example, while the terminal with which the belt was equipped is communicating with the access point which uses 802.11 protocols, it may be desirable to use the cordless ring scanner which is using the Bluetooth protocol and which communicates with the same belt wearing terminal. For example, once a user wearing terminal. And bar code information is transmitted to a belt wearing terminal from AP. This end probably a message needs to be transmitted to a belt wearing terminal from AP. This terminal needs to communicate with the peripheral device which became possible according to other Bluetooth like a printer or a head set again. Although a communications protocol like 802.11 or Bluetooth was designed so that the equipment which uses the same protocol might ensure operating within the same frequency band with the minimum interference, the adjustment approach of use of each radio equipment in the same frequency which operates under a different communications protocol until now did not exist.

[0008] In addition, it is desirable to prepare the voice service which used the Bluetooth communications protocol between the terminals and head sets which the user puts on, for example and with which the belt was equipped. Bluetooth supports the voice communication which used the synchronous system connection mod (SCO) packetized voice transmission at 3.75 meters/s. It becomes difficult to effort 802.11 communication links and voice transmission according to the need for such frequent Bluetooth packet transmission using the Bluetooth SCO packet.

[0010]
[Problem(s) to be Solved by the Invention] It is the purpose of this invention that the both sides of the equipment which follows, for example, becomes possible by Bluetooth and 802.11 uses for coincidence the adjustment technique which ensures to operate robust with the same frequency band, and the 2nd wireless transceiver which operates according to said 1st communications protocol, and the 2nd wireless transceiver which operates according

[0011]
[Means for Solving the Problem] The gestalt of operation of this invention operates according to the 1st communications protocol (they are 802.11 protocols). The 1st wireless transceiver which uses a frequency band (they are 2.4GHzISM bands), the base station which operates according to the 1st communications protocol, and the 2nd wireless transceiver which operates according

to the 2nd communications protocol (it is the Bluetooth protocol) — and it is combined with the base station, and in order, make the 1st wireless transceiver energize, made the 1st wireless transceiver de-energize, the 2nd wireless transceiver was made to energize, and it has the regulator for making the 2nd wireless transceiver de-energize.

[0012] The 1st wireless transceiver and the 2nd wireless transceiver are carried in [both] housing suitable for equipping a belt, a laptop computer, or PDA. It is combined with the 2nd transceiver and 1 or the slave unit beyond it operates according to the 2nd communications protocol. It is possible for the scanner to be contained in the slave unit, and for a user's finger to be equipped, and to transmit bar code information to the 2nd transceiver, a printer, or personal-data management equipment.

[0013] The 1st transceiver and the 2nd transceiver can be equipped with the antenna of rectangular polarization in the arrangement carried in [both] housing. By another arrangement, the Bluetooth protocol transceiver transmits with the power level of about 0dBm. Moreover, in another equipment, it has two or two sub-bands or more in said frequency band, a 802.11 protocol transceiver uses one of two or the two sub-bands or more, and the Bluetooth protocol transceiver uses one or these the two sub-bands or more. Moreover, in another arrangement, it has the look ahead function for judging whether 2 or the sub-band beyond it used and also by the 2nd transceiver into the 2nd wireless transceiver is used by the 1st wireless transceiver. Furthermore, in another arrangement, in order to make the 2nd wireless transceiver de-energize while the 1st wireless transceiver uses it, it has the regulator combined with the 1st wireless transceiver.

[0014] According to this invention, the approach of operating the portable data communication unit which uses the 1st wireless data communications protocol and the 2nd wireless data communications protocol is shown. The action time for the 1st communications protocol being used for this data communication unit, and transmitting and receiving a data communication signal and equipment operates in the power reduction mode of the 1st communications protocol with the quiescent time to which neither transmission nor reception carries out a data communication signal using said 1st protocol. A data communication unit operates as master equipment with the 2nd communications protocol, and controls actuation of the slave unit to which this data communication unit communicates with it by it. The actuation by the 2nd data communication protocol is controlled to operate only between the quiescent times of said 1st protocol.

[0015] Is the gestalt of 1 operation, the signal which shows that action time begins following a predetermined time interval is established in order to end actuation with the 2nd data communication protocol between these predetermined time intervals. The 1st wireless data communications protocols are 802.11 protocols. The 2nd radio protocol is Bluetooth.

[0016] In another side face of this invention, it has one access point and at least one portable type unit combined with the access point using the 1st wireless protocol (it is 802.11), and the approach of operating the wireless data telecommunication system arranged so that a portable type unit may perform other equipment and wireless data transmission using the 2nd wireless protocol (it is Bluetooth) is shown. A periodic beacon signal is transmitted from an access point by the 1st wireless protocol. It has prevented transmitting a comprehensive ready-for-sending ability signal from an access point by the 1st wireless protocol, and a portable type unit transmitting a signal between the time intervals distributed by it in the beacon signal period using the 1st data communication protocol. An access point is controlled to avoid the right message of an allocation time interval, and a portable type unit answers a comprehensive ready-for-sending ability signal functions as master equipment which uses the 2nd wireless protocol between allocation time intervals, and it operates so that radio may be performed.

[0017] In the gestalt of 1 operation, the beacon signal period is divided into three time intervals, an access point performs data communication in power reduction mode between the 1st time interval, an access point performs data communication between the 2nd time interval using the 2nd communications protocol, and an access point performs data communication between the 3rd time interval using the 1st wireless protocol. The 1st time interval can follow a beacon signal immediately. In the gestalt of another operation, the 1st time interval may not be made not to be

used.

[0016] According to another side face of this invention, the method of operating a data telecommunication system using a master-slave protocol (it being (like Bluetooth)) is shown, a master transceiver transmits to a slave unit between the 1st even number time slots, a slave unit is transmitted to this master equipment between odd number time slots, and transmission follows the frequency hop pattern predetermined at the hop ratio corresponding to a time slot. Master equipment operates so that an interference signal may be detected on the frequency corresponding to the following time slot in the 1st hour of each time slot. When an interference signal is detected between either of the time slots current or it, the transmission by the master transceiver is forbidden between even number time slots.

[0018] The actuation phase includes adjusting so that a signal may be received corresponding to the frequency distributed to the time slot to which master equipment follows a degree in suitable operation, detecting the reinforcement of the received signal, and readjusting so that a signal may be transmitted and received corresponding to the frequency on which master equipment is distributed to the current time slot.

[0020] In another side face of this invention, the approach for giving voice communication to the wireless data telecommunication system equipped with the portable type unit which is arranged so that it may communicate with an access point using the 1st data communication protocol (it is (like 802.11)), and is arranged so that it may communicate with other equipments using the 2nd data communication protocol (it is (like Bluetooth)) is shown. The 1st data communication protocol is used for the data corresponding to the voice communication, and they communicate between an access point and a portable type unit. The data corresponding to voice communication communicate between a portable type unit and portable equipment using the 2nd data communication protocol. The communication link is arranged with a time interval which avoids a communication interference using the 1st data communication protocol. A sound signal is changed into the data corresponding to this sound signal, and the data signal corresponding to a sound signal is changed into a sound signal in portable equipment.

[0021] In suitable equipment, the data corresponding to a sound signal are compressed sound signal data. As for the communication list between a portable type unit and portable equipment, it is desirable to use the Bluetooth ACL link.

[0022] According to another side face of this invention, it is arranged so that it may communicate using the 1st and 2nd data communication protocol which operates in the same frequency band (it is (like 802.11 and Bluetooth)), and it is combined with an access point, and the approach for operating the portable type unit which came to receive from there the beacon signal which divides a time interval clearly with the 1st communications protocol is shown again. A signal is received from the access point (it is (like a CTS signal)) which specifies a part of one time interval which inhibits the transmission for which the portable type unit operates with the access point uses the 1st data communication protocol. A portable type unit operates as master equipment, in order to communicate with a slave unit in between for a specification part [time interval] using the 2nd data communication protocol.

[0023] According to another side face of this invention, it has at least one access point and at least one portable type unit again. A portable type unit communicates with an access point within the 1st frequency band using the 1st wireless data communications protocol (it is (like 802.11)). The approach for operating the wireless data network arranged so that it may communicate with other equipments within the 1st frequency band using the 2nd wireless data communications protocol (it is (like Bluetooth)) is shown. The signal (it is (like CTS)) transmitted from an access point in the 1st communications protocol specifies the time amount which has inhibited that the portable type unit is combined with the access point transmits using the 1st data communication protocol. A portable type unit operates in order to perform the equipment and wireless data transmission which operate as a slave unit between said equipment time amount as master equipment using said 2nd data communication protocol besides the above.

[0024] According to side face of this invention another again, the approach for operating the portable type unit is arranged so that it may communicate using the 1st data communication protocol and the 2nd data communication protocol which operate within the same frequency

band (it is (like 802.11 and Bluetooth)) is shown, and a portable type unit is combined with an access point there. The portable type unit has received the 1st and 2nd adjustment signal using the 1st data communication protocol. A portable type unit operates as master equipment corresponding to the 1st adjustment signal, and performs a slave unit and data communication using the 2nd data communication protocol. The communication link by the portable type unit which uses the 2nd data communication protocol answers the 2nd adjustment signal, and is interrupted.

[0025] (Gestalt of implementation of invention) two or more base stations [drawing 1] — or — physical — the cable network 10 — connection 40 and the access point (AP) carried out 50 — 20 and 30 are shown. Although a cable network with the access point of a large number connected to CPU12 is a typical example of application, a system can also use a simple computer and single AP. Each AP is equipped with the equipments 60 and 70 for transmitting a radio frequency (RF) signal and receiving under 802.11 protocols, moreover, 802.11 protocols — using R — two or more wireless transceivers or a portable type unit (MU) — 120 and 140 communicate using equipments 80 and 90 for transmission of a RF signal, and reception Each MU 120 and 140 is combinable with a wireless transceiver again, this wireless transceiver is the Bluetooth master (BTM) equipments 130 and 150, and both these equipments form the dual mode equipments 100 and 110. The combination between MU and BTM is made by, for example, holding in the same equipment physically. The example of the dual mode equipments 100 and 110 is a pocket terminal with which a belt is equipped.

[0026] Each BTM 130 and 150 is communicating with 1 or the Bluetooth slave (BTS) equipments 160, 170, 180, 190, 200, and 210 beyond it via the Bluetooth protocol. The Bluetooth protocol is established so that each BTS may combine with BTM uniquely. Therefore, BTS one A160, BTS1B170, and BTS1C180 communicate only with BTM130 using RF signals 220, 230, and 240 as explained. This forms the pico network 260. Therefore, BTS two A190, BTS2B200, and BTS2C210 communicate with BTM2150 using RF signals 250, 260, and 270. This forms the pico network 290. The examples of BTS are a cordless ring scanner, a printer, and personal-data management equipment.

[0027] When there is no adjustment, what it is going to operate when MU 120 and 140 combined with BTM 130 and 150 and these is completely the same happens. In order that these two equipments may operate with the same 2.4GHzISM band, when it will interfere in BTM 130 and 150 and MU 120 and 140 violently mutually and they are held especially in the dual mode equipments 100 and 110, they are so. Therefore, it is necessary to adjust two equipments. One of such the adjustment approaches is mainly suitable in the environment controlled especially based on time multiplied transmission of 802.11 and BT wireless (for example, when 802.11 and BT wireless are held in the same terminal or dual mode equipment). In the gestalt of a certain operation, the Bluetooth system becomes possible or impossible with global/central signal from 802.11AP explained here. A central signal is also adjusted without adjustment with AP between two equipments.

[0028] Furthermore, in the gestalt of another operation, the dual mode equipments 100 and 110 are designed so that 802.11 antennas 80 and 90 may become rectangular polarization about the Bluetooth antenna made to generate RF signals 220, 230, 240, 250, 280, and 270. With this technique, protection additional about 802.11 Bluetooth interference is given, and the need for CG is bad.

[0029] Drawing 8 shows an example of the rectangular polarization antenna used in order to decrease interference. The antenna structure of drawing 8 contains the unipolar antenna 502 of perpendicular polarization connected to the transmitter/receiver by transmitting Rhine 510 out of balance. This structure contains the bipolar antenna of concurrency polarization equipped with the bipolar arms 504 and 506 connected to the transmitter/receiver by transmitting Rhine 508 which was able to take balance again. This contractor will have it recognized that the antenna array of much other rectangular polarization is used.

[0030] In the gestalt of another operation, BTM 130 and 150 is designed so that it may transmit to a relative target lower than 0dBm with low power level. This technique can give additional protection to 802.11 Bluetooth interference, and it can be used for it with other antennas or

frequency regulation approaches which were explained here.

[0031] In the gestalt of another operation, it can design so that 802.11AP 20 and 30 and MU 120 and 140 may operate by a part of 2.4GHz spectrum, but BTM 130 and 150 and BTS 160, 170, 180, 190, 200, and 210 can be designed so that it may operate in other parts of 2.4GHz spectrum.

[0032] BTM 130 and 150 can be equipped with the look ahead function to judge whether which frequency in 2.4GHz is used about two or two Bluetooth frequency hop or more which will be generated in the future, in the gestalt of another operation. When BTM 130 and 150 judges that the same frequency as 802.11 systems are using it in two or two following frequency hop or more is used, BTM 130 and 150 makes an output a null and decreases the interferential action to transmission of 802.11 according to it. By using this approach, Bluetooth and the interference between 802.11 are decreased or removed by dropping the packet of a lot, when duplication of a channel arises. This coping-with method is also extensible so that even 802.11 transmission and thinking of the adjacent channel in which it may interfere may similarly be included.

[0033] Bluetooth is frequency-hopping diffusion spectrum which hops still more quickly than almost all IEEE802.11 wireless. (FHSS) Wireless is used. Bluetooth transmits a short packet, piling up in a predetermined frequency. Almost all IEEE802.11 wireless hops into and transmits a longer packet. Moreover, it does not hop but there is also a version of IEEE802.11 WLAN which uses the direct sequence diffusion spectrum (DSSS) which makes a private use of a large band.

[0034] As a result, during transmission of an IEEE802.11 packet, the Bluetooth radio hops between many frequencies and transmits a packet to each frequency potentially. These Bluetooth packets may interfere with an IEEE802.11 packet, and may cause the error of an IEEE802.11 packet. It is necessary to retransmit a message to an IEEE802.11 packet and, and R may be again made into an invalid by the signal from the Bluetooth wireless.

[0035] This technique shown is drawing 5 is usable also in which Bluetooth wireless which operates in the IEEE802.11 WLAN environment, and which equipment. Since the technique detects the equipment currently emitted with 2.4GHz ISM bands, it can also be used in order to prevent interference with other equipments in the band.

[0036] The Bluetooth network is constituted by the Bluetooth equipment to eight pieces which operate in a pico network. The pico network is equipped with one master and the slave to seven pieces. 1600 hop comes out comparatively per second, and said all Bluetooth equipments in a pico network hop all at once. The time amount to which a frequency hopper piles up in a specific frequency is called a slot time. At this rate of hop, a slot time is 625 microseconds. Usually, although a packet is completed within 1 slot time, it is also possible to have 3 to 5 slot packet. A master and a slave transmit by turns. A master is an even number slot and a slave is transmitted by the odd number slot. Please refer to the Bluetooth specification version 1.0 on December 1, 1999 which incorporates the whole here by citation.

[0037] The link of two types is between the master equipment in the Bluetooth pico network, and each slave unit. First, there is an asynchronous unconstrained link (ACL) used for data transmission. Next, there is a synchronous system connecting link (SCO) used for transmitting voice data. The master of a pico link determines when the data on an ACL link are transmitted. Data are transmitted, when this master has data transmitted to a slave, or when this master wants to receive data from a slave.

[0038] Each Bluetooth equipments in a pico network frequency hop all at once according to a false random sequence. drawing 3 — sequence (of a frequency) f (1), f (2), and _ f (n) — the equipment which hops along with _ is shown. Moreover, in order that this drawing may change the frequency synthesizer of wireless at a new frequency and the transmitting period for 405 microseconds, it is shown how the slot time includes the period for 220 microseconds for 625 microseconds.

[0039] As explained above, between even number slot T (i), a master transmits to a slave, and a slave returns transmission to a master between odd number slot R (i). A master can be transmitted in all even number time slots. A slave can be transmitted to a master in a time slot, only when a master carries out packet transmission in a front time slot at a slave. When a master does not transmit data to all the slave in a slot (n), either, any slaves cannot perform

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transmission in a slot (n+1). The exception of this regulation is a thing about a SCO link packet, and data are always transmitted at the predetermined periodic spacing in this case. Therefore, about an ACL link, when a master does not transmit data, a slave does not transmit data.

[0040] In current, a pico network master does not presuppose that it will judge whether other equipments use spectrum before their transmission. When there is an IEEE802.11 packet by which current transmission is carried out as the result, the Bluetooth master does not dare check whether an alien system is transmitting, and coincidence and when possible, also itself, it transmits on the same frequency. As a result, the Bluetooth master may interfere with an IEEE802.11 packet and unstable reception of a packet may produce it.

[0041] Subdividing the segment time interval for 220 microseconds and further spending some of the time amount, since the following frequency is foreseen, and checking whether other equipments are transmitting by these channels is proposed. It is because this master has cleared slave #1 and it transmits between the next time slots of a frequency f (n+1), when, as for the reason for foreseeing, a master transmits a message to slave #1 in frequency f (n).

(a) Therefore, a master needs to foresee the frequency corresponding to the following time slot. The time interval for 220 microseconds is subdivided as follows. In 80 microseconds of the beginning, the re-stroke of the frequency synthesizer of a master is carried out to f (n+1), and a master hears the signal in the band in the following 60 microseconds. This is executable by using the standard receiving annunciator (RSSI) on the strength in a wake-take. And in the following 80 microseconds, a frequency synthesizer carries out the re-stroke of the wireless to f (n).

Drawing 5 shows the newly shown time-slot division.

[0042] It investigates whether just before receiving on a frequency f (n-1), the frequency band of a master of f (n) is clear. Moreover, before transmitting by frequency f (n), a master checks that a frequency band f (n+1) is clear again. If frequency band f (n) and f (n+1) are clear, a master will enable a slave to transmit in frequency band f (n), consequently to transmit with a frequency band f (n+1) in the following time slot.

[0043] A master investigates whether the re-stroke of the wireless to f (n).

[0044] It investigates whether just before transmitting in the following time interval between time slots R. Transmission will not be performed if the time slot is occupied.

[0044] Next, the schematic diagram of drawing 3 is referred to in relation to the concrete layout shown in drawing 1. Here, another technique of transmitting adjustment is shown. The 802.11 beacon time interval T300 is divided into 802.11 communication links with three time intervals. I.e. the power reduction (PSP) mode of of 802.11 (PSP310), a Bluetooth communication link called (NAV320), and 802.11 communication links with activity mode CAM called 802.11 (CAM330). It depends for the persistence time of a time interval T, 802.11 (PSP, UNAV, and 802.11 (CAM) on a traffic property and the need for equipment (for example, time amount marginal service). In imitation of each beacon time amount 300, AP20 transmits the beacon signal 350 to 802.11 (PSP)MU(s) 120 and 140 which awaits in this period (some PSP)MU(s) made with a different beacon). PSP(MU) 120 and 140 performs reception of a packet, and transmission at this period according to 802.11 protocol. Once all PSP(MU)s) 120 and 140 receive a packet, AP20 is comprehensive ready-for-sending ability, in order to intercept all 802.11 communication links at a NAV (network allocation vector) period. (CTS) A signal is transmitted. The pico networks 280 and 290 combined with these BT(MU)s) 130 and 150 enable it to start the BT communication links 360 and 370 by BTM 130 and 150 (for it to hold in the same dual mode equipments 100 and 110) by which 802.11(MU) 120 and 140 is combined with them at this time. After termination of the NAV period 320, BTM150 and 150 media-taking become incompetent, and also and all BT communication links. The remaining time amount (up to the following beacon 380) becomes only for 802.11 continuation recognition mode (CAM) MU (not shown) which operates only with 802.11 protocols.

[0045] In the gestalt of another operation, when MU does not operate in PSP mode, 802.11(PSP)310 time interval may be omitted. Here, the CTS signal 340 carries out the trigger only of a time interval (NAV)320 and 802.11(CAM)330 in the 802.11 beacon each period T320. [0046] In the gestalt of another operation, when MU does not operate in CAM mode, 802.11(CAM)330 time interval may be omitted. Here, the CTS signal 340 carries out the trigger

only of the tNAV320 and t802.11PSP310 time interval in the 802.11 beacon each period T300.

[0047] the gestalt of another operation — setting — the Bluetooth system — instead of (from AP20) — global/central signal from the dual mode equipments 100 and 110 — possible-izing — or it is made impossible.

[0048] The gestalt of another operation of this invention is explained about said schematic diagram of drawing 4 in relation to the concrete layout shown in drawing 1. In this approach, 802.11AP does not need to adjust transmission between Bluetooth and 802.11. To instead of, the Bluetooth network operates through the course of normal until it directs it that 802.11BU suspends transmission of a message to the Bluetooth slave to one or all the Bluetooth masters. In case an asynchronous uncombined (ACS) packet is used, the Bluetooth master adjusts access about the pico network. Therefore, a slave is also stopped when a master suspends transmission. Once 802.11BU completes a communication link, the Bluetooth master can resume the communication link with the Bluetooth slave. This technique is useful especially when all 802.11BU is in PSP mode. It is because these equipments are in half mode in almost all cases.

[0049] When MU120 desires 802.11 communication-link initiation as shown in drawing 4, a stop signal 400 is transmitted to BTM 130 and 150. And MU120 communicates 450 with AP20 using 802.11 protocols. If ready for whose MU120 ending the communication link of a period t802.11470, and resuming power saving mode, MU120 will communicate a start signal 410 to BTM 130 and 150. And BTM 130 and 150 uses BT protocol between periods t8T490, and starts 430 or 440 communication links to each BTS 160, 170, 190, and 200. When "it senses" in order for 12t802.11MU11 terminal to transmit data or to hear 802.11 beacon from AP20, MU120 transmits the stop signal 420 which notifies that MU120 has taken over access to a medium to BTM 130 and 150. Before MU120 needs exclusive use of a medium, it turns BTM 130 and 150 of it, for example, about 4 microseconds is needed by this warning before access. By this warning, BTM 130 and 150 completes some packet transmission, and suspends each communication link with BTS 160, 170, 190, and 200. Then, MU120 sets communication link 450 to AP20 in the new period t802.11480.

[0050] In the gestalt of another operation, periods t802.11480 and t8T490 are predetermined spacing fixed through the communication link process. In the gestalt of another operation, periods t802.11480 and t8T490 are the do length of the same time amount.

[0051] In the gestalt of another operation, it is the voice sending set designed in order that BTS 160, 170, 180, 190, 200, and 210 might transmit a head set or voice data to BTM 110 and 130, and voice data is transmitted via 802.11 network next. Speech information is usually transmitted on the Bluetooth network using a periodic generator lock orientation (SCO) protocol. This protocol does not flow to transmission interruption required to adjust with actuation of 802.11. In case Bluetooth and 802.11 are used, it is more efficient to transmit voice in the Bluetooth network using the ACL protocol usually saved for data transmission. In order to use the ACL protocol with which the Bluetooth pico networks 280 and 290 are usually saved for data transmission in order to use the voice transmission on Bluetooth, when used with the frequency regulation technique currently indicated here, it is necessary to compress speech information and to elongate.

[0052] Reference of drawing 7 and drawing 8 shows the voice communication system 520 containing the head set 521 equipped with the BTS radio equipment 210 which communicates with a dual mode portable type unit using BT protocol. The head set 521 is equipped with the earphone in the same housing as the wireless unit 210 and a microphone 522. The portable type unit 110 can be arranged so that it may be used equipping a user's belt. BTS210 is equipped with D-A and A-D converter 526 for [the] changing conversely for the microphone 522, the earphone 524, and the sound signal to the digital signal again as shown in drawing 8. The digitized sound signal is compressed, is arranged by the packet by the processor 528, and is transmitted using the RF module 530 and an antenna 532. A reverse process is used for reception of a signal. The RF module 530 communicates with MU110 in ACL mode using BT protocol.

[0053] I hear that the Bluetooth equipment of low power ensures 802.11 equipments of high power being interlocked with and actually operating, and another problem produced by the

attempt which adjusts 802.11 and Bluetooth equipment has it. In this point, the gestalt of another operation of this invention is explained with reference to drawing 2. Drawing 2 is substantially the same as that of a part of drawing 1, and the connection carbon button 500 and light 540 which were prepared on MU160 of 802.11 networks are added. Dual mode equipment 110 is specifically equipped with the connection carbon button 500. If it operates by the user, the connection carbon button 500 will stop the night message of the time amount defined beforehand to the portable type unit 140 — it needs (time-out) — it directs. For example, the time-out continues for 10 seconds. By this time-out, during a timeout period, the Bluetooth pico network 290 can avoid the interference from 802.11 equipment, and can establish actuation. Once it is established, the pico network 290 will start a light 540, in order to guarantee to a user that the Bluetooth pico network 290 was established as a matter of fact. Termination of a timeout period uses other approaches for the frequency regulation explained here.

[0054] although what is considered to be the gestalt of this invention has been explained, this contractor is an intention which comes out and charges the thing which can recognize that other modification and correction are made, which will exist, and which it carries out. and modification of all them and correction belong within the limits of the truth of the invention, without separating from the preamble of this invention.

[Translation done]

* NOTICES *

TECHNICAL FIELD

[Field of the invention] This application changes the profits of temporary application of the serial numbers 60/175,282 of January 10, 2000 presentation, and temporary application of the serial numbers 60/196,979 of April 13, 2000 presentation. If this invention is further specified about a wireless data network, it relates to the equipment for guaranteeing coexistence between the wireless networks which share the same frequency band as a different actuation protocol.

[Translation done.]

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* NOTICES *

PRIOR ART

[Description of the Prior Art] Radio equipment communicates mutually using the protocol which is transmitted in a predetermined frequency band end on which it has agreed. The equipment which uses one or the wireless protocol beyond it operates by transmission in the same frequency band in many cases. Therefore, in order for the equipment which uses one or the wireless protocol beyond it to operate efficiently within the same frequency band to coincidence, it is necessary to develop adjustment technique.

[0003] For example, the grantee of this invention supplies the wireless data telecommunication system following the IEEE802.11 standard (802.11) communications protocol incorporated here by citation known as spectrum (Spectrum) 24 (trademark). If this system is carried out, a portable type unit (NU) will consider data communication as a central computer through one or the access point beyond it (AP). AP communicates with a computer through a direct or Ethernet (trademark) cable network. Each of NU is combined with one of the AP. This communications protocol is using the 2.4GHzISM band as defined as 802.11.

[0004] In that by which the current design is carried out, in order that 802.11 equipment may work as a wireless Local Area Network, some predetermined approaches will be used for the transmission in a 2.4GHz band. One approach is using a frequency-hopping diffusion spectrum (FHSS) mechanism, in it, time amount transmission is carried out and data continues transmission in a channel which has been set to the specific channel and which is different by the de length of predetermined time amount similarly following a false random sequence. 802.11 equipments designed now operate at the rate of cycle hop of 10 hop per second sequence. Another approach is using a direct sequence diffusion spectrum (DSSS) mechanism, according to it, said data are transmitted in a predetermined cycle channel, and the multiplication of the pseudo-random chipping sequence between transmission is carried out.

[0005] Since all 802.11 equipments are using the same ISM frequency band, the interference in these equipments is minimized by use of a subcarrier sensing multi-access / collision-prevention (CSMA/CA) protocol. Under CSMA/CA, he asks whether 802.11 equipment has the transmission from another equipment, before starting its transmission. If other transmission is not detected, equipment transmits its information and waits for the acknowledgement (ACK) from receiving-side equipment. When reception acknowledgement is not received, after with a predetermined time interval after which for equipment between the time intervals chosen at random, it transmits again. Therefore, two or the equipment beyond it transmission to coincidence, and when interference produced as a result bars all transmission, in order that each equipment may by retransmission of message, it will wait for it the time chosen at random. This enables equipment to transmit to separate time amount.

[0006] Another example of the wireless specification which similarly uses said 2.4GHzISM frequency band is Bluetooth (trademark), and this is designed for the communication link between the equipment within the narrow limits transmitted with lower power level. The Bluetooth specification is available at www.bluetooth.com. Bluetooth is operating at a rate of 1600 hop per second using a frequency-hopping diffusion spectrum mechanism as designed now. Bluetooth uses communicative master/slave system. An example of the Bluetooth network is a portable type unit with which the belt of the user who communicates with the cordless scanner

with which reads a bar code and a user is equipped as a ring is equipped. In this case, a portable type unit operates as a master and a cordless ring scanner operates as a slave. In the system for this data transmission, a master and a slave communicate only in predetermined spacing. At the 1st spacing, a master communicates to the 1st slave unit and the 1st slave unit answers only between the 2nd spacing. At the 3rd spacing, a master communicates to the 2nd slave unit and the 2nd slave unit answers only between the 4th spacing, by using this system, it is one equipment in specific Bluetooth "a pico network" — it becomes certain that an injury transmits to specific time amount. Therefore, interference is minimized.

[0007] In addition, as for one Bluetooth pico network, it is desirable to approach the Bluetooth channel which another object separated, and to operate. It is because there is a cyclo came to operate on the same frequency as coincidence. Therefore, the interference during the separate Bluetooth pico network is minimized. Many individuals who approach mutually and are working by this, for example can own each portable type unit with a cordless ring scanner.

[0008] The need of adjusting transmission of the equipment which operates under a different protocol which uses the same frequency band with the need of approaching and operating many networks of the same protocol is recognized in the industry. For example, while the terminal with which the belt was equipped is communicating with the access point which uses 802.11 protocol, it may be desirable to use the cordless ring scanner which is using the Bluetooth protocol and which communicates with the same belt wearing terminal. For example, once a user scans a bar code using a cordless ring scanner, bar code information will be transmitted to a belt wearing terminal. And bar code information is transmitted to 802.11 AP. and probably a message needs to be transmitted to a belt wearing terminal from AP. This terminal needs to communicate with the peripheral device which becomes possible according to other Bluetooth like a printer or a head set again. Although a communications protocol like 802.11 or Bluetooth was designed so that the equipment which uses the same protocol might ensure operating within the same frequency band with the minimum interference, the adjustment approach of use of each radio equipment in the same frequency which operates under a different communications protocol until now did not exist.

[0009] In addition, it is desirable to prepare the voice service which used the Bluetooth communications protocol between the terminals and head sets which the user puts on, for example and with which the belt was equipped. Bluetooth supports the voice communication which used the synchronous system connection orid (SCO) packetized voice transmitted at 3.75 meter/s. It becomes difficult to adjust 802.11 communication Erda and voice transmission according to the need for such frequent Bluetooth packet transmission using the Bluetooth SCO packet.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] It is the purpose of this invention that the both sides of the equipment which follows, for example, becomes possible by Bluetooth and 802.11 use for coincidence the adjustment technique which ensures to operate robust with the same frequency band.

[Translation done.]

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* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] The gestalt of operation of this invention operates according to the 1st communications protocol (they are 802.11 protocol). The 1st wireless transceiver which uses a frequency band (they are 2.4GHzISM band), the base station which operates according to said 1st communications protocol, and the 2nd wireless transceiver which operates according to the 2nd communications protocol (it is the Bluetooth protocol) -- and it is combined with the base station, and in order, make the 1st wireless transceiver energize, made the 1st wireless transceiver de-energize, the 2nd wireless transceiver was made to energize, and it has the regulator for making the 2nd wireless transceiver de-energize.

[0012] The 1st wireless transceiver and the 2nd wireless transceiver are carried in [both] housing suitable for equipping a belt, a laptop computer, or PDA. It is combined with the 2nd transceiver and 1 or the above unit beyond it operates according to the 2nd communications protocol. It is possible for the scanner to be contained in the slave unit, and for a user's finger to be equipped, and to transmit bar code information to the 2nd transceiver, a printer, or personal-data management equipment.

[0013] The 1st transceiver and the 2nd transceiver can be equipped with the antenna of rectangular polarization in the arrangement carried in [both] housing. By another arrangement, the Bluetooth protocol transceiver transmits with the power level of about 0dBm. Moreover, in another equipment, it has two or two sub-bands or more in said frequency band, a 802.11 protocol transceiver uses one of two or the two sub-bands or more, and the Bluetooth protocol transceiver uses one or these the two sub-bands or more. Moreover, in another arrangement, it has the look ahead function for judging whether 2 or the sub-band beyond it used also by the 2nd transceiver into the 2nd wireless transceiver is used by the 1st wireless transceiver. Furthermore, in another arrangement, in order to make the 2nd wireless transceiver de-energize while the 1st wireless transceiver uses it, it has the regulator combined with the 1st wireless transceiver.

[0014] According to this invention, the approach of operating the portable data communication unit which uses the 1st wireless data communications protocol and the 2nd wireless data communications protocol is shown. The action time for the 1st communications protocol being used for this data communication unit, and transmitting and receiving a data communication signal and equipment operate in the power reduction mode of the 1st communication with the quiescent time to which neither transmission nor reception carries out a data communication signal using said 1st protocol. A data communication unit operates as master equipment with the 2nd communications protocol, and controls actuation of the slave unit to which this data communication unit communicates with it by it. The actuation by the 2nd data communication protocol is controlled to operate only between the quiescent times of said 1st protocol.

[0015] In this gestalt of 1 operation, the signal which shows that action time begins following a predetermined time interval is established in order to and actuation with the 2nd data communication protocol between these predetermined time intervals. The 1st wireless data communication protocols are 802.11 protocols. The 2nd radio protocol is Bluetooth.

[0016] In another side face of this invention, it has one access point and at least one portable

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type unit combined with the access point using the 1st wireless protocol (it is 802.11), and the approach of operating the wireless data telecommunication system arranged so that a portable type unit may perform other equipment and wireless data transmission using the 2nd wireless protocol (it is Bluetooth) is shown. A periodic beacon signal is transmitted from an access point by the 1st wireless protocol. It has prevented transmitting a comprehensive ready-for-sending ability signal from an access point by the 1st wireless protocol, and a portable type unit transmitting a signal between the time intervals distributed by it in the beacon signal period using the 1st data communication protocol. An access point is controlled to avoid the right message of an allocation time interval, and a portable type unit answers a comprehensive ready-for-sending ability signal, functions as master equipment which uses the 2nd wireless protocol between allocation time intervals, and it operates so that radio may be performed.

[0017] In the gestalt of 1 operation, the beacon signal period is divided into three time intervals, an access point performs data communication in power reduction mode between the 2nd time interval, an access point performs data communication between the 2nd time interval using the 2nd communications protocol, and an access point performs data communication between the 3rd time interval using the 1st wireless protocol. The 1st time interval can follow a beacon signal immediately. In the gestalt of another operation, the 1st time interval may not be made not to be used.

[0018] According to another side face of this invention, the method of operating a data telecommunication system using a master-slave protocol (it being (like Bluetooth)) is shown, a master transceiver transmits to a slave unit between the 1st even number time slots, a slave unit is transmitted to this master equipment between odd number time slots, and transmission follows the frequency hop pattern predetermined at the hop rate corresponding to a time slot. Master equipment operates so that an interference signal may be detected on the frequency corresponding to the following time slot in the 1st hour of each time slot. When an interference signal is detected between either of the time slots before current or it, the transmission by the master transceiver is forbidden between even number time slots.

[0018] The actuation phase includes adjusting so that a signal may received corresponding to the frequency distributed to the time slot to which master equipment follows a degree in suitable operation, detecting the reinforcement of the received signal, and readjusting so that a signal may be transmitted and received corresponding to the frequency on which master equipment is distributed to the current time slot.

[0020] In another side face of this invention, the approach for giving voice communication to the wireless data telecommunication system equipped with the portable type unit which is arranged so that it may communicate with an access point using the 1st data communication protocol (it is (like 802.11)), and is arranged so that it may communicate with other equipments using the 2nd data communication protocol (it is (like Bluetooth)) is shown. The 1st data communication protocol is used for the data corresponding to voice communication, and they communicate between an access point and a portable type unit. The data corresponding to voice communication is changed into the data corresponding to this sound signal, and the data signal corresponding to a sound signal is changed into a sound signal in portable equipment.

[0021] In suitable equipment, the data corresponding to a sound signal are compressed sound signal data. As for the communication link between a portable type unit and portable equipment, it is desirable to use the Bluetooth ACL link.

[0022] According to another side face of this invention, it is arranged so that it may communicate using the 1st and 2nd data communication protocol which operates in the same frequency band (it is (like 802.11 and Bluetooth)), and it is combined with an access point, and the approach for operating the portable type unit which came to receive from there the beacon signal which divides a time interval clearly with the 1st communications protocol is shown again. A signal is received from the access point (it is (like a CTS signal)) which specifies a part of one time interval which inhibits the transmission for which the portable type unit combined with the

access point uses the 1st data communication protocol. A portable type unit operates as master equipment, in order to communicate with a slave unit in between for a specification part [time interval] using the 2nd data communication protocol.

[0022] According to another side face of this invention, it has at least one access point and at least one portable type unit again. A portable type unit communicates with an access point within the 1st frequency band using the 1st wireless data communication protocol (it is (like 802.11)). The approach for operating the wireless data network arranged so that it may communicate with other equipments within the 1st frequency band using the 2nd wireless data communication protocol (it is (like Bluetooth)) is shown. The signal (it is (like OTSI)) transmitted from an access point in the 1st communication protocol inhibited that the portable type unit combined with the access point transmits using the 1st data communication protocol. A portable type unit operates in order to perform the equipment and wireless data transmission which operate as a slave unit between said equipment time amount as master equipment using said 2nd data communication protocol besides the above.

[0023] According to side face of this invention another again, the approach for operating the protocol unit arranged so that it may communicate using the 1st data communication protocol and the 2nd data communication protocol which operate within the same frequency band (it is (like 802.11 and Bluetooth)) is shown, and a portable type unit is combined with an access point there. The portable type unit has received the 1st and 2nd adjustment signal using the 1st data communication protocol. A portable type unit operates as a master equipment corresponding to the 1st adjustment signal, and performs a slave unit and data communication using the 2nd data communication protocol. The communication link by the portable type unit which uses the 2nd data communication protocol answers the 2nd adjustment signal, and is interrupted.

[0025] (Gestalt of implementation of invention) two or more base stations ([drawing 1] — or — physical — the cable network 10 — connection 40 and the access point (AP) carried out 50 — 20 and 30 are shown. Although a cable network with the access point of a large number connected to OSPUT2 is a typical example of application, a system can also use a single computer and single AP. Each AP is equipped with the equipments 60 and 70 for transmitting a radio frequency (RF) signal and receiving under 802.11 protocols. Moreover, 802.11 protocols — using 2 — two or more wireless transceivers or a portable type unit (MU) — 180 and 140 communicate using equipments 80 and 90 for transmission of a RF signal and reception. Each MU 120 and 140 is combinable with a wireless transceiver again. It's wireless transceiver is the Bluetooth master (BTM) equipments 100 and 110. The combination between MU and BTM is made by, for example, holding in the same equipment physically. The example of the dual mode equipments 100 and 110 is a pocket terminal with which a belt is equipped.

[0026] Each BTM 130 and 150 is communicating with 1 or the Bluetooth slave (BTS) equipments 160, 170, 180, 200, and 210 beyond it, via the Bluetooth protocol. The Bluetooth protocol is established so that each BTS may combine with BTM uniquely. Therefore, BTS one A190, BTS1B170, and BTS10180 communicate only with BTM1130 using RF signals 220, 230, and 240 as explained. This forms the pico network 280. Therefore, BTS two A190, BTS2B200, and BTS2C210 communicate with BTM150 using RF signals 250, 260, and 270. This forms the pico network 290. The examples of BTS are a cordless ring scanner, a printer, and personal-data management equipment.

[0027] When there is no adjustment, what it is going to operate when MU 120 and 140 combined with BTM 130 and 150 and these is completely the same happens. In order that these two equipments may operate with the same 2.4GHzISM band, when it will interfere in BTM 130 and 150 and MU 120 and 140 violently mutually and they are held especially in the dual mode equipments 100 and 110, they are so. Therefore, it is necessary to adjust two equipments. One of such the adjustment approaches is mainly suitable in the environment controlled especially based on time multiplied transmission of 802.11 and BT wireless (for example, when 802.11 and BT wireless are held in the same terminal or dual mode equipment). In the gestalt of a certain operation, the Bluetooth system becomes possible or impossible with global/central signal from

802.11AP explained here. A central signal is also adjusted without adjustment with AP between two equipments.

[0028] Furthermore, in the gestalt of another operation, the dual mode equipments 100 and 110 are designed so that the 802.11 antennas 80 and 90 may become rectangular polarization about the Bluetooth antenna made to generate RF signals 220, 230, 240, 250, 260, and 270. With this technique, protection additional about 802.11 Bluetooth interference is given, and the need for CCI is fast.

[0029] Drawing 8 shows an example of the rectangular polarization antenna used in order to decrease interference. The antenna structure of drawing 8 contains the unipolar antenna 502 of perpendicular polarization connected to the transmitter/receiver by transmitting Rhine 510 out of balance. This structure contains the bipolar antenna of concurrency polarization equipped with the tripolar arms 504 and 506 connected to the transmitter/receiver by transmitting Rhine 508 which was able to data balance again. This contractor will have it recognized that the antenna array of much other rectangular polarization is used.

[0030] In the gestalt of another operation, BTM 130 and 150 is designed so that it may transmit to a relative target lower than 0dBm with low power level. This technique can give additional protection to 802.11 Bluetooth interference, and it can be used for it with other antennas or frequency regulation approaches which were explained here.

[0031] In the gestalt of another operation, it can design so that 802.11AP 20 and 30 and MU 120 and 140 may operate by a part of 2.4GHz spectrum, but BTM 130 and 150 and BTS 160, 170, 180, 190, 200, and 210 can be designed so that it may operate in other parts of 2.4GHz spectrum.

[0032] BTM 130 and 150 can be equipped with the look ahead function to judge whether which frequency is 2.4GHz is used about two or more Bluetooth frequency hop or more which will be generated in the future. In the gestalt of another operation. When BTM 130 and 150 judges that the same frequency as 802.11 systems are using it in two or two following frequency hop or more is used, BTM 130 and 150 makes an output a null and decreases the interferential action to transmission of 802.11 according to it. By using this approach, Bluetooth and the interference between 802.11 are decreased or removed by dropping the packet of a lot, when duplication of a channel arises. This copies with method is also extensible so that even 802.11 transmission and blanking of the adjacent channel in which it may interfere may similarly be included.

[0033] Bluetooth is frequency-hopping diffusion spectrum which hops still more quickly than almost all IEEE802.11 wireless. (FHSS) Wireless is used. Bluetooth transmits a short packet, piling up in a predetermined frequency. Almost all IEEE802.11 wireless hops late and transmits a longer packet. Moreover, it does not hop but there is also a version of IEEE802.11WLAN which uses the direct sequence diffusion spectrum (DSSS) which makes a private use of a large band.

[0034] As a result, during transmission of an IEEE802.11 packet, the Bluetooth radio hops may be again made into an invalid by the signal from the Bluetooth wireless.

[0035] This technique shown in drawing 5 is usable also in which Bluetooth wireless which operates in the IEEE802.11WLAN environment, and wireless equipment. Since the technique detects the equipment currently emitted with 2.4GHzISM bands, it can also be used in order to prevent interference with other equipments in the band.

[0036] The Bluetooth network is constituted by the Bluetooth equipment to eight pieces which operate in a pico network. The pico network is equipped with one master and the slave to seven pieces. 1500 hop comes out comparatively per second, and said all Bluetooth equipments in a pico network hop all at once. The time amount to which a frequency hopper piles up in a specific frequency is called a slot time. At this rate of hop, a slot time is 825 microseconds. Usually, although a packet is completed within 1 slot time, it is also possible to have 3 to 5 slot packet. A master and a slave transmit by turns, a master is an even number slot and a slave is transmitted by the odd number slot. Please refer to the Bluetooth specification version 1.0 on December 1, 1999 which incorporates the whole here by citation.

[0037] The first of two types is between the master equipment in the Bluetooth pico network, and each slave unit. First, there is an asynchronous unconnected link (ACL) used for data transmission. Next, there is a synchronous system connecting link (SCO) used for transmitting voice data. The master of a pico link determines when the data on an ACL link are transmitted. Data are transmitted, when this master has data transmitted to a slave, or when this master wants to receive data from a slave.

[0038] Each Bluetooth equipment in a pico network frequency hop all at once according to a false random sequence, drawing 5 — sequence [of a frequency] f (1), f (2), and ... f (n) — the equipment which hops along with ... is shown. Moreover, in order that this drawing may change the frequency synthesizer of wireless at a new frequency and the transmitting period for 625 microseconds, it is shown how the slot time includes the period for 220 microseconds for 405 microseconds.

[0039] As explained above, between even number slot T (0), a master transmits to a slave, and a slave returns transmission to a master between odd number slot R (0). A master can be transmitted in all even number time slots. A slave can be transmitted to a master in a time slot, only when a master carries out packet transmission in a front time slot at a slave. When a master does not transmit data to all the slave in a slot (n), either, any slaves cannot perform transmission in a slot (n+1). The exception of this regulation is a thing about a SCO link packet, and data are always transmitted at the predetermined periodic spacing in this case. Therefore, about an ACL link, when a master does not transmit data, a slave does not transmit data.

[0040] In current, a pico network master does not presuppose that it will judge whether other equipments use spectrum before their transmission. When there is an IEEE802.11 packet by which current transmission is carried out as the result, the Bluetooth master does not dare check whether an alien system is transmitting, and coincidence and when possible, also itself, it transmits on the same frequency. As a result, the Bluetooth master may interfere with an IEEE802.11 packet and unsuitable reception of a packet may produce it.

[0041] Subdividing the alignment time interval for 220 microseconds at some division periods, spending some of the time amount, since the following frequency is foreseen, and checking whether other equipments are transmitting by these channels is proposed. It is because this master has cleared slave #1 and it transmits between the next time slots of a frequency f (n+1), when, as for the reason for foreseeing, a master transmits a message to slave #1 in frequency f (n). Therefore, a master needs to foresee the frequency corresponding to the following time slot. The time interval for 220 microseconds is subdivided as follows. In 60 microseconds of the beginning, the re-stroke of the frequency synthesizer of a master is carried out to f (n+1), and a master hears the signal in the band in the following 60 microseconds. This is executable by using the standard receiving annunciator (RSSI) on the strength in a radio-table. And in the following 80 microseconds, a frequency synthesizer carries out the re-stroke of the wireless to f (n).

[0042] It investigates whether other equipments are transmitting by these channels is proposed. It is because this master has cleared slave #1 and it transmits between the next time slots of a frequency.

[0043] A master investigates the frequency band similarly used for transmitting in the following time interval between time slots R. Transmission will not be performed if the time slot is occupied.

[0044] Next, the schematic diagram of drawing 3 is referred to in relation to the concrete layout shown in drawing 1. Here, another technique of transmitting adjustment is shown. The 802.11 beacon time interval T300 is divided into 802.11 communication links with three time intervals. I.e. the power reduction (PSP) mode of 802.11PSP310, a Bluetooth communication link called tNAV320, and 802.11 communication links with activity mode OAM called 802.11CAM300. It depends for the persistence time of a time interval T, 802.11PSP, tNAV, and 802.11CAM on a traffic property and the need for equipment (for example, time amount required service). In relation of each beacon time amount 300, AP20 transmits the beacon signal 350 to

802.11PSP310(s) 120 and 140 which awaits in this period (same PSP310(s)) awake with a different beacon. Period PSP310 120 and 140 performs reception of a packet, and transmission at this period according to 802.11 protocol. Once all PSP310(s) 120 and 140 receive a packet, AP20 is comprehensive ready-for-sending ability, in order to intercept all 802.11 communication links at a NAV (network allocation vector) period (CTS) A signal is transmitted. The pico networks 280 and 250 combined with these BTNK(s) 130 and 150 enable to start the BT communication links 360 and 570 by BTM 130 and 150 (for it to hold) in the same dual mode equipments 100 and 110) NAV period 320, BTM130 and 150 water-buffalos become incompetent, and also and all BT communication links. The remaining time amount (up to the following beacon 380) becomes only for 802.11 continuation recognition mode (CAM) MU (not shown) which operates with 802.11 protocols.

[0045] In the gestalt of another operation, when MU does not operate in PSP mode, 802.11PSP310 time interval may be omitted. Here, the CTS signal 340 carries out the trigger only of a time interval tNAV320 and 802.11CAM330 in the 802.11 beacon each period T300.

[0046] In the gestalt of another operation, when MU does not operate in CAM mode, 802.11CAM330 time interval may be omitted. Here, the CTS signal 340 carries out the trigger only of the tNAV320 and 802.11PSP310 time interval in the 802.11 beacon each period T300.

[0047] The gestalt of another operation — setting — the Bluetooth system — instead of [from AP20] — global/central signal from the dual mode equipments 100 and 110 — possible-izing — or it is made impossible.

[0048] The gestalt of another operation of this invention is explained about said schematic diagram of drawing 4 in relation to the concrete layout shown in drawing 1. In this approach, 802.11 AP does not need to adjust transmission between Bluetooth and 802.11. To instead of, the Bluetooth network operates through the course of normal until it directs it that 802.11 MU suspends transmission of a message to the Bluetooth slave to one or all the Bluetooth masters. In case an asynchronous unconnected (ACS) packet is used, the Bluetooth master adjusts access about the pico network. Therefore, a slave is also stopped when a master suspends transmission. Once 802.11 MU completes a communication link, the Bluetooth master can resume the communication link with the Bluetooth slave. This technique is useful especially when all 802.11 MU is in PSP mode. It is because these equipments are in halt mode in almost all cases.

[0049] When MU120 desires 802.11 communication-link initiation as shown in drawing 4, a stop signal 400 is transmitted to BTM 130 and 150. And MU120 communicates 450 with AP20 using 802.11 protocols. If ready for whose MU's120 ending the communication link of a period 802.11470, and resuming power saving mode, MU120 will communicate a start signal 410 to BTM 130 and 150. And BTM 130 and 150 once BT protocol between periods tBT460, and starts 430 or 440 communication links to each BTS 160, 170, 180, and 200. When "it awakes" in order for 120802.MU11 terminal to transmit data or to hear 802.11 beacon from AP20, MU120 transmits the stop signal 420 which notifies that MU120 has taken over access to a medium to BTM 130 and 150. Before MU120 needs exclusive use of a medium, it warns BTM 130 and 150 of it, for example, about 4 microseconds is needed by this warning before access. By this warning, BTM 130 and 150 completes some packet transmission, and suspends each communication link with BTS 160, 170, 180, and 200. Then, MU120 sets communication link 460 to AP20 in the new period 802.11490.

[0050] In the gestalt of another operation, periods 802.11480 and tBT480 are predetermined spacing fixed through the communication link process. In the gestalt of another operation, periods 802.11480 and tBT480 are the de length of the same time amount.

[0051] In the gestalt of another operation, it is the voice sending set designed in order that BTS 160, 170, 180, 190, 200, and 210 might transmit a head set or voice data to BTM 110 and 130, and voice data is transmitted via 802.11 network next. Speech information is usually transmitted on the Bluetooth network using a periodic generator lock orientation (SCO) protocol. This protocol does not flow to transmission interruption required to adjust with activation of 802.11. In case Bluetooth and 802.11 are used, it is more efficient to transmit voice in the Bluetooth network using the ACL protocol usually saved for data transmission. In order to use the ACL

protocol with which the Bluetooth pico networks 280 and 290 are usually saved for data transmission in order to use the voice transmission on Bluetooth, when used with the frequency regulation technique currently indicated here, it is necessary to compress speech information and to elongate.

[0052] Reference of drawing 7 and drawing 8 shows the voice communication system 520 containing the head set 521 equipped with the BTS radio equipment 210 which communicates with a dual mode portable type unit using BT protocol. The head set 521 is equipped with the earphone in the same housing as the wireless unit 210 and a microphone 522. The portable type unit 110 can be arranged so that it may be used equipping a user's belt. BTS210 is equipped with D-A and A-D converter 528 for [the] changing commonly for the microphone 522, the earphone 524, and the sound signal to the digital signal again as shown in drawing 8. The digitized sound signal is compressed, is arranged by the packet by the processor 528, and is transmitted using the RF module 530 and an antenna 532. A reverse process is used for reception of a signal. The RF module 530 communicates with MU110 in ACL mode using BT protocol.

[0053] I hear that the Bluetooth equipment of low power ensures 802.11 equipments of high power being interlocked with and actually operating, and another problem produced by the attempt which adjusts 802.11 and Bluetooth equipment has it in this point, the gestalt of another operation of this invention is explained with reference to drawing 2. Drawing 2 is substantially the same as that of a part of drawing 1, and the connection carbon button 500 and light 540 which were prepared on MU140 of 802.11 networks are added. Dual mode equipment 110 is specifically equipped with the connection carbon button 500. If it operates by the user, the connection carbon button 500 will stop the night message of the time amount defined beforehand to the portable type unit 140 — it needs (time-out) — it directs. For example, this time-out continues for 10 seconds. By this time-out, during a timeout period, the Bluetooth pico network 280 can avoid the interference from 802.11 equipment, and can establish saturation. Once it is established, the pico network 280 will start a light 540, in order to guarantee to a user that the Bluetooth pico network 280 was established as a matter of fact. Termination of a timeout period uses other approaches for the frequency regulation explained here.

[0054] although what is considered to be the gestalt of suitable operation of this invention has been explained, this contractor is an intention which comes out and charges the thing which can recognize that other modification and correction are made, which will exist, and which it carries out and modification of all them and correction belong within the limits of the truth of this invention, without separating from the presume of this invention.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of the radio communications system which uses 802.11 and Bluetooth equipment.
[Drawing 2] It is the block diagram of the radio communications system which is equipped with the display machine connected with the connection button switch, and uses 802.11 and Bluetooth equipment for coincidence.
[Drawing 3] It is the schematic drawing of the gestalt of operation of this invention showing the time-axis to which 802.11 and Bluetooth equipment were adjusted.
[Drawing 4] It is the schematic drawing of the gestalt of operation of this invention showing another time-axis to which 802.11 and Bluetooth equipment were adjusted.
[Drawing 5] It is the diagram showing the Bluetooth actuation approach of having been corrected for avoiding interference.
[Drawing 6] It is drawing showing an example of a rectangular polarization antenna.
[Drawing 7] It is drawing of the wireless head set, fixed for voice communication.
[Drawing 8] It is the block diagram of the head set of drawing 7.

[Description of Notation]
10 Cable Network
12 CPU
20 Access Point
30 Access Point
60 70 RF-signal transmission and receiving set
80 90 802.11 antennas
100 110 Dual mode equipment
120 140 Portable type unit
130 150 Bluetooth master equipment
160, 170, 180 Bluetooth slave unit
190, 200, 210 Bluetooth slave unit
220, 230, 240 RF signal
250, 260, 270 RF signal
280 290 Pico network

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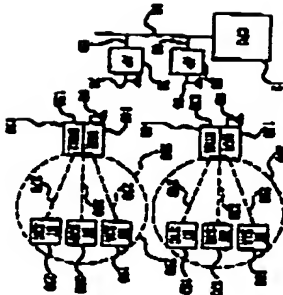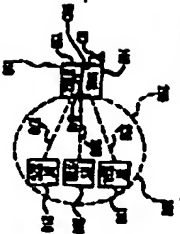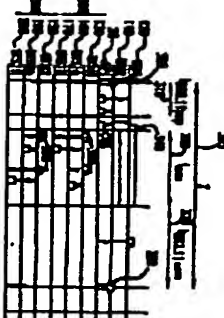damages caused by the use of this translation.

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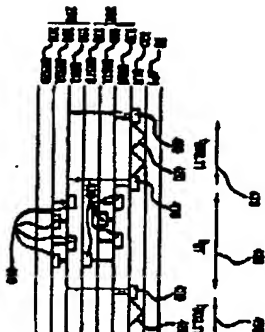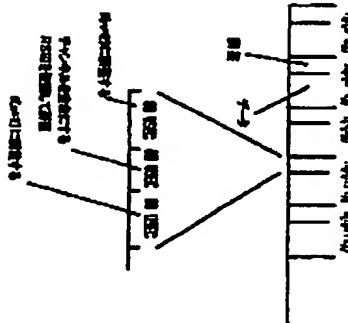
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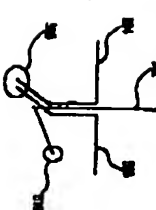
[Drawing 1]

[Drawing 2]

[Drawing 3]

[Drawing 4]

[Drawing 5]

[Drawing 6]

[Drawing 7]

[Drawing 8]

[Translation done.]